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Abstract 15800: Aging is Associated With an Earlier Arrival of Reflected Waves Without a Distal Shift in Reflection Sites.

Phan, Timothy S; Li, John K; Segers, Patrick; Koppula, Maheswara R; Akers, Scott R; Kuna, Samuel T; Gislason, Thoraninn; Pack, Allan I; Chirinos, Julio A
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[Hypertension: ABSTRACT Only]

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Background: Despite pronounced increases in carotid-femoral pulse wave velocity (PWV) with aging, timing of the inflection point (TINF) in the central pressure waveform does not appreciably decrease. Because TINF has been interpreted as a marker of reflected wave transit time (RWTT), its dissociation from the changes in PWV led to the controversial proposition of a "distal shift" of arterial reflection sites with aging. However, TINF represents a poor surrogate of RWTT. We assessed whether aging is indeed associated with a distal shift in reflection sites when appropriate pressure-flow analyses are used.

Methods: We studied a sample of unselected adults without cardiovascular disease (n=48; median age 48 years) and a clinical population of older adults with suspected or established cardiovascular disease (n=164; 61 years). We measured central pressure and flow with carotid tonometry and phase-contrast MRI, respectively. We assessed RWTT using wave-separation analysis and partially-distributed tube-load arterial system modeling.

Results: Consistent with previous reports, TINF did not appreciably decrease with age despite pronounced increases in PWV in both populations, falsely suggesting a proximal shift in reflection sites. However, when pressure-flow analyses were applied, aging was clearly associated with pronounced decreases in RWTT by either wave separation analysis (general population:-15.0 msec/decade; $P<0.001$; clinical population:-9.07 msec/decade; $P=0.003$) or tube load modeling (general:-15.8 msec/decade; $P<0.001$; clinical:-11.8 msec/decade; $P<0.001$). There was no evidence of an increased effective reflecting distance by either method. TINF was shown to reliably represent RWTT only under highly unrealistic assumptions about human input impedance.

Conclusions: RWTT declines with age in parallel with increased PWV, with earlier arrival of wave reflections and without a distal shift in reflecting sites. Our findings disprove the proposition of a distal shift in reflection sites, which was advanced based on TINF, a poor surrogate of RWTT. These findings have important implications for our understanding of the role of the forward wave vs. reflections with aging and various disease states.

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Institution

(1)Medicine, Univ of Pennsylvania; Rutgers Univ, Philadelphia, PA, (2)Medicine, Univ of Pennsylvania, Philadelphia, PA, (3)Medicine, Ghent Univ, Belgium, Belgium, (4)Medicine, Univ of Pennsylvania; VA Med Cntr, Philadelphia, PA, (5)Dept of Respiratory Medicine and Sleep, Landspítali, The National Univ Hosp of Iceland. Reykjavik, Iceland, Reykjavik, Iceland, (6)Medicine, Univ of Pennsylvania; VA Med Cntr; Ghent Univ, Philadelphia, PA

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